SERINE CATABOLISM IN *PLODIA INTERPUNCTELLA* (HÜBNER)[1]

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INTRODUCTION

Adult male Lepidoptera generally have a higher lipid content than do adult females. Although the metabolic basis for this phenomenon has been studied (Gilbert, 1967; Mohler and Yurkiewicz, 1970a, 1970b), it remains unclear. Experiments on castration and implantation of gonads (Gilbert and Schneiderman, 1961) indicate that egg production only partially explains the sexual dimorphism in lipid content. It has been suggested (Gilbert, 1967; Domroese and Gilbert, 1964) that male Lepidoptera may convert non-lipid substrates, such as carbohydrates or amino acids, into lipid or the male may metabolize non-lipid substrates at a higher rate, thus conserving lipid. Our earlier experiments, however, revealed no differences between the sexes of the Indian meal moth, *Plodia interpunctella* (Hübner), in conversion of glucose into lipid (Mohler and Yurkiewicz, 1970a) or in the catabolism of glucose into carbon dioxide (Mohler and Yurkiewicz, 1970b). This report is a study of the effects of sex on the metabolism of the amino acid serine during the pupal period of *P. interpunctella.*

MATERIALS AND METHODS

Methods of insect rearing, injection, lipid analysis, and carbon dioxide collection were as described earlier (Mohler and Yurkiewicz, 1970b). Each injection of 0.5 ul in volume contained enough L-serine-^{14}C (Uniformly labeled, 135mc/mM) to produce 30,500 disintegrations per minute. Radio-activity was counted by standard liquid scintillation methods (Yurkiewicz, 1969).

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RESULTS AND DISCUSSION

The incorporation of label from serine into lipids of *P. interpunctella* is shown in Table 1. The data indicate a similar rate of utilization of amino acid for lipid synthesis in both sexes, thus eliminating the possibility that amino acids are used to build up lipid stores in the male. Table 2 shows that the catabolism of serine into carbon dioxide is also nearly the same in both sexes. Therefore, it appears that amino acids are not used by the male in order to conserve lipid.

Table 1. Radioactivity recovered in lipid fractions of adult *Plodia interpunctella* injected with 30,500 disintegrations per minute of L-serine ^{14}C at last larval instar.

	Male (N= 9) 571[1] ± 190[2]	Female (N= 15) 644 ± 181
Lipid fraction	Per cent in fractions	
Phospholipid	36.8	37.3
Diglyceride	4.7	5.4
Free Fatty Acid	0.9	0.6
Triglyceride	54.2	53.6
Sterol Ester	2.1	1.2
Hydrocarbon	1.4	1.9

[1]Total disintegrations per minute recovered.

[2]Standard deviation.

Table 2. Radioactivity in carbon dioxide recovered during pupal period from *Plodia interpunctella* injected at last larval instar with 30,500 disintegrations per minute of L-serine-^{14}C.

Male (N= 24)	Female (N= 19)
845[1] ± 320[2]	825 ± 280

[1]Disintegration per hour collection.

[2]Standard deviation.

However, the fact remains that last instar larval male and female *P. interpunctella* have similar contents, whereas as adults eight days later the male has twice as much lipid (Yurkiewicz, 1969). The results of this paper combined with our earlier studies on glucose metabolism suggest that non-lipid components are not utilized to synthesize the extra lipid in the male nor are they catabolized in place of lipid. The data would seem to support a theory by Gilbert and Schneiderman (1961) that some male Lepidoptera are genetically more efficient in lipid utilization than females. But we feel it is possible that the female may have an, as of yet, undetected expenditure of energy during the pupal period. We are examining the rate of lipid catabolism and the energy consumed by both sexes in pupal case and cocoon formation in order to check this possibility.

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ABSTRACT:—The incorporation of carbon label from serine into lipids of *Plodia interpunctella* is similar in both sexes. The catabolism of serine to carbon dioxide is also nearly the same. It appears that amino acids are not used by the male in order to conserve lipid. The results of this paper combined with earlier studies on glucose metabolism suggest that non-lipid components are not utilized to synthesize the extra lipid in the male nor are they catabolized in place of lipid. The data would seem to support a theory that some male Lepidoptera are genetically more efficient in lipid utilization than females.—William J. Yurkiewicz and J. Harold Mohler, Department of Biology, Millersville State College, Millersville, Pennsylvania 17551.

Descriptors: Serine-^{14}C catabolism, Indian meal moth, *Plodia interpunctella,* lipid, Lepidoptera.